2020-21 CAP RESEARCH EXPERIENCE FOR TEACHERS PROGRAM

PROGRAM DESCRIPTION & JUSTIFICATION

The Central Arizona-Phoenix Long-Term Ecological Research Program (CAP LTER, or CAP) has been producing cutting edge knowledge about urban systems science for more than 22 years, and our Ecology Explorers Program has been putting CAP knowledge into the hands of Phoenix area teachers throughout this time. CAP also provides local K-12 educators with access to nearly 60 research faculty and dozens of students and postdoctoral fellows representing a diverse array of disciplines and fields of expertise. As a supplement to our ongoing Ecology Explorers Schoolyard LTER work, we propose to pair two outstanding Roosevelt Public School District teachers with researchers from relevant Interdisciplinary Research Teams (IRTs) of CAP to improve the science expertise of our Phoenix area teachers.

Our proposed 2020-21 RET Program will build strongly upon the robust inroads we made last year with the Roosevelt School District in South Phoenix, with our 2019 RET supplemental support from the NSF. This school district is once again the focus of our enhanced RET work with K-12 teachers because: 1) it serves a lower income, predominantly Hispanic population (97% of the students are minority); b) it includes one of our Phoenix Area Social Survey (PASS) neighborhoods (#U18), where 93% of residents are Mexican/Latino, where the median annual household income is less than $37,000 and where less than 4% of residents hold a bachelor's degree or above; Larson et al. 2017); c) it is part of the City of Phoenix's South Mountain Village (which is 63% Hispanic and 15% Black), where our scenarios and futures work is currently taking place; d) it is near the Rio Salado and South Mountain parks, where our Parks & Rivers IRT is working; and e) our Ecology Explorers Program has been working with teachers from the District for many years, and we already have teacher and administrator connections, collaborations, and a history of success.

This past year, our RETs (Caroline Carlson and Monique Franco, Roosevelt School District) used their Summer 2019 research experiences with CAP scientists to develop and produce new science curriculum for their school district. Caroline and Monique's research with Dr. Kevin McGraw focused on the color patterns of house finches are affected by urban versus non-urban environments. Their work with Dr. McGraw helped these two teachers dive deeply into the nature of science and the process of scientific inquiry. These perspectives and understanding have been applied to their creation of a new instructional unit that supports the new Arizona State Science Standards and that was incorporated into a district-wide teacher training that was held in January 2020. We propose to segue these 2019 RET successes into our expanded 2020-21 RET work with two more Roosevelt School District teachers.

Implementing the CAP 2020-21 RET Program:

Both teachers will be exposed to a variety of research experiences in the CAP Program, and will be able to choose the specific research collaboration that fits best with their interests and pedagogical needs. The main RET Program research will be conducted primarily during the summer months of 2020 and 2021, but will continue through the 2020-21 school year to optimize the transition of information from the summer research experiences to the classroom. The participating teachers will have the option to change the focus of their 2021 summer research to meet their expanding curiosity and needs.

There will be four components to RET involvement with CAP:

1. Both teachers will be briefed about the overall CAP research program and will be asked to choose an IRT for their Summer 2020 research experience, with the option to expand their research experience in another direction in Summer 2021 if they choose. Of our eight IRTs, the four that are most logical for RET collaborations are Residential Landscapes & Neighborhoods, Scenarios & Futures, Parks & Rivers, and Adapting to City Life; we have identified potential faculty and student mentors for RET participants in all four IRTs. For example, if a teacher is interested in how people interact with their immediate residential environments, they might choose to work with the Residential Landscapes & Neighborhoods IRT. If they are interested in nearby recreational spaces or urban flora and fauna, they might choose to work with the Parks & Rivers IRT or Adapting to City Life IRT, respectively. And if they are interested in knowing more about a sustainable future for South Mountain Village, they might choose to work with the Scenarios & Futures IRT.
2. Each teacher will be required to spend six summer weeks, during both summers, conducting field and lab work with mentors from the IRT of their choosing. They will work on an independent research project that best fits their interests, classroom needs, and curriculum development goals. These projects may involve the use of existing long-term data, collecting new data, or a combination of the two.
3. Towards the end of both summers and after the summer research has been completed, we will host a half-day mini-workshop where the RET participants will informally present their research findings, discuss their summer experiences, receive input from other members of their IRTs, and finalize their plan for translating their experiences into their 6-8th grade classrooms, their K-8 school district, and their curriculum. This mini-workshop will also help prepare the teachers to present their research and classroom experiences at a statewide or national science educator conference during the school year.
4. During the 2020-21 school year the teachers will bring their hands-on research experiences into the classroom for their students. The teachers will develop classroom activities that incorporate their CAP data, and we will provide support both for related in-class activities and for field trips to CAP research sites. They will work with other district teachers to build upon the instructional unit work of the 2019 RET educators and will work with their district's administrators on curriculum enhancements based on their research experiences. They will continue their collaborative research experiences with their IRT mentors and other CAP researchers throughout the school year, leading up to their second intensive research experience in Summer 2021.

Translating RET experiences into classroom practice:

Sara Rojo and Natasha Nethero have both committed to several activities that will allow them to translate their research experiences to Phoenix area students and into advances in science curricula:

1. Self-development as science educators through their direct work as researchers alongside professional research scientists.
2. Integration of their new research knowledge and skills into classroom curricular materials, classroom activities, and field trips. This includes modeling of scientific research protocols

and practices, incorporating the relevance of our local urban and Sonoran Desert ecosystems einto required curricular concepts, and encouraging career exploration into scientific fields.

3. Expansion of work done during 2019-20 with a 'cross-walk' tool that aligns our dozens of CAP LTER Ecology Explorers lessons with district objectives for Science, Mathematics, and ELA/English Language learning, to be utilized district-wide.
4. Lead a district-wide workshop for K-8 teachers, introducing them to Ecology Explorers resources, the fundamentals of scientific research, and the cross-walk tool they developed.
5. Present on their research and classroom experiences at the Arizona Science Teachers Association Conference, in Fall 2020, introducing Association members to Ecology Explorers resources and demonstrating how research-classroom integration worked in the Roosevelt School District.
6. Apply to present on their research and classroom experiences at a national level conference, describing their experiences with research, integration into their classrooms and across the district, and demonstrating the breadth of positive outcomes for teachers empowered to work with research scientists and institutions of higher learning.

Selection criteria for RET participants:

The CAP LTER Ecology Explorers program has worked with hundreds of teachers for over 20 years and was highly effective in working with our 2019-20 RETs. For our 2020-21 RET opportunity, we again solicited applications from Roosevelt School District teachers in order to build upon the impact we have already been making district-wide. We then sought out those who were interested in participating as a partner-team, as this partnered approach produces superior outcomes for the teachers, through collegial support, while also compounding impacts when the two teachers work to implement district-wide change as a team. We solicited biographical sketches (included here), and a short essay describing how this RET opportunity would impact their students, teaching, curriculum, school, and the district.

Research mentor experience and selection:

Because of this past year's extensive experience in working with the Roosevelt School District, we are confident in our ability to select and manage the best research mentor or mentors for our RET participants. Many CAP faculty, postdocs, and students have worked closely with our Ecology Explorers program through other NSF-funded education programs, including a 10-year IGERT focused on urban ecology, a more recently funded GK12 grant, and our currently funded Urban Resilience to Extremes Sustainability Research Network (SRN). We have budgeted a small summer salary, in both summers, for the faculty who agree to mentor and work with our 2020-21 RET educators.

LITERATURE CITED

Larson, K.L., R. Andrade, and A. York, 2017. The Phoenix Area Social Survey IV: Linking social and biophysical dynamics in urban neighborhoods. Program Report, pp.44.

TEACHER BIOGRAPHICAL SKETCHES

Natasha Nethero: I am currently teaching 6th grade at Sunland Elementary. In 2008, I started my teaching career in the Roosevelt School District. I spent nine years teaching fourth grade. In 2017, I taught the most incredible group of fourth graders, and we had the opportunity to learn together for the next three years. The opportunity to "loop" with this group of students was a highlight in my career; it also stretched me to learn new grade level content (5th) and later departmentalize as a 6th grade science teacher. Becoming a 6th grade science teacher is a new and welcomed challenge. I love learning new content and teaching a subject that compliments my teaching style and philosophy, which is hands-on, inquiry-stimulated, and student-driven education.

I graduated from Central Washington University with my bachelor's degree in Spanish and Bilingual Education in 2007. Since then, I have earned a Master's Degree in Elementary Education from Arizona State University. I've taught in the Roosevelt School District my entire career; I can't imagine teaching anywhere else. I choose to work in Roosevelt because it is filled with the most incredible students, families, and teachers. Together, we find every opportunity to improve and grow. We do our best despite a system that can sometimes keep us down.

Sara Rojo: I began my career in the Roosevelt School District right after college graduation. I did not specifically choose to teach in an underserved community. Very simply put, Roosevelt was the only district was hiring in the middle of the school year. What began as happenstance quickly became one of the best choices in my life. I quickly found the stereotypes that accompany teaching in an inner city school to be false—my students are curious and brilliant, and I am lucky to have them! Through teaching in the Roosevelt District I found my purpose, and my passion.

I don’t see teaching in an underserved community as some sort of sacrifice, or that I am doing something heroic. I am here to give my students the best education I can, because they deserve it. They enrich my life every day, and I will continue to work to bring them as many opportunities as possible. After 14 years, I cannot imagine teaching anywhere else. What began as my only option has now become my only choice.